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Materiel Test Procedure 5-3-022
U. S. Army Field Artillery Board

3888
U. S. ARMY TEST AND EVALUATION COMMAND
COMMODITY SERVICE TEST PROCEDURE

CONTAINER, SHIPPING AND STORAGE, ROCKET AND MISSILE, SSM

1. OBJECTIVE

The objective of this procedure is to outline subtests designed to determine if the missile or rocket shipping container under test meets the requirements of the QMR and is suitable for field artillery use.

2. BACKGROUND

In contrast to their capability of carrying destructive warheads the missile body of a modern missile is a relatively delicate mechanism. It must be protected during shipment and transport in order to function successfully. Containers are being improved from time to time and must continually undergo service test to ensure suitability for field artillery use.

3. REQUIRED EQUIPMENT

- a. Organizational Shop Facility
- b. Tools and Tool Sets organic to the unit
- c. Photographic Equipment
- d. Scales and Measuring Equipment
- e. Stopwatches
- f. Pressure Gage
- g. Missile/Rocket and associated handling equipment
- h. Tactical Assembly Area
- i. Tactical Firing Area
- j. System Transporters
- k. Field Storage Area
- l. Missile/Rocket Checkout Facilities

4. REFERENCES

- A. USATECOM Regulation 385-6, Verification of Safety of Materiel During Testing.
- B. USAMC Regulation 385-12, Verification of Safety of Materiel from Development Through Testing, Production, and Supply to Disposition.
- C. MTP 5-3-500, Preoperational Inspection and Physical Characteristics.
- D. MTP 5-3-502, Manuals and Technical Literature.
- E. MTP 5-3-507, Human Factors Engineering.
- F. MTP 5-3-510, Safety Hazards.
- G. MTP 10-3-501, Operator Training and Familiarization.
- H. MTP 10-3-503, Transportability (General Supplies and Equipment).
- I. MTP 10-3-504, Maintenance Evaluation.
- J. MTP 7-3-515, Air Transport, Internal (Suitability of Equipment for).
- K. MTP 7-3-516, Air Transport, External (Suitability of Equipment for).

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5. SCOPE

5.1 SUMMARY

This procedure describes the following subtests:

- a. Preparation for Test - An outline of the pre-test requirements relating to inspection, site preparation and training.
- b. Functional Performance - An evaluation of the test item's capability to withstand rough handling, and an evaluation of the loading-unloading and mobility and sequential troop handling procedures under timed, deliberate (untimed), adverse and simulated combat conditions.
- c. Pressure Test - A procedure to determine loss of container pressure under varying conditions.
- d. Rain Test - An evaluation to determine the capability of the container to withstand soaking rain.
- e. Field Storage - A study to determine the effects of field storage upon the container and its contents.
- f. Transportability - An evaluation to determine the ability of the test item, complete with missile or rocket section, to be transported by surface and aircraft.
- g. Human Factors Engineering - An evaluation of design features that influence the man-test item compatibility.
- h. Maintenance - A study to determine the maintainability of the test container.
- i. Safety - An evaluation to determine safety hazards and to confirm the safety characteristics of the test item.

5.2 LIMITATIONS

When test criteria contained herein conflict with the QMR, testing will be in accordance with the QMR.

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Safety Precaution

- a. The test officer will ensure that a Safety Release has been received from HQ, USATECOM in accordance with USATECOM Reg. 385-6 and that it is understood before testing is started. Since much container testing will be done with the rocket or missile, the Safety Release must include the rocket or missile.
- b. All measures necessary will be taken to preclude any explosion of rocket or missile motors.
- c. Appropriate first aid equipment with attending personnel will be on hand as required.

6.1.2 Photographic Requirements

Ensure the availability of appropriate still photographic equipment

to portray field storage conditions, deterioration, broken parts, malfunctions or other difficulties with the test item or related equipment and motion picture equipment for use as appropriate.

6.1.3 Arrival Inventory

Conduct an inventory of the test item to include all tools and ancilliary equipment and record any missing items.

6.1.4 Preoperational Inspection and Service

- a. Perform a complete Technical Inspection of the test item and its associated equipment as described in the applicable sections of MTP 5-3-500.
- b. Perform operational maintenance as required.
- c. Record results of inspection and maintenance to include:

- 1) Ease of performance.
- 2) Adequacy of tools supplied (to include tools authorized at using unit level).
- 3) Tools required but not furnished.
- 4) Material workmanship defects.
- 5) Damage during shipment.

6.1.5 Physical Characteristics

- a. Measure and record the length, width, height, circumference, diameter and other appropriate measurements of the test item.
- b. Photograph the test item showing outside and inside configuration.

6.1.6 Personnel

- a. Ensure the availability of service personnel who have been trained using the criteria of MTP 10-3-501 in conjunction with the appropriate technical publications and training manuals of MTP 5-3-502 and are cognizant of the handling, maintaining, loading/unloading and safety hazard aspects of the test item and the object of the procedure.
- b. Record the adequacy of the supplied training literature.
- c. Record the following for all test personnel:
 - 1) Rank
 - 2) MOS
 - 3) Experience in MOS
 - 4) Training time in MOS

6.1.7 Facilities and Equipment

- a. Select and schedule test areas at appropriate hardstand test sites.
- b. Upon notice of arrival of the test item arrange for or secure:
 - 1) Safety releases as appropriate.

- 2) Maintenance facilities.
- 3) Container transporters and other related equipment used to remove missile/rocket from container and for checkout.

c. Arrange for field storage area for container complete with rocket/missile.

6.2 TEST CONDUCT

6.2.1 Functional Performance

Determine the functional performance characteristics of the test item by performing the following:

6.2.1.1 Rough Handling

Determine the containers capability to withstand rough handling and yet fully protect the missile or rocket as follows:

6.2.1.1.1 Tip Test - Place the container, complete with missile or rocket section, on level ground and perform the following:

- a. Extend the anti-tip device or mechanism.
- b. Open the lid of the container to its full operational extent.
- c. Apply a tipping force of approximately 250 pounds to the lid.
- d. Remove the missile or rocket section observe and record the container resistance to tipping.

6.2.1.1.2 Drag Test - Perform the following:

- a. Place the container complete with missile or rocket section on an approximately level asphalt surface. Drag the container endways first by one end and then by the other for a distance of approximately 30 feet.
- b. Remove missile or rocket and record any evidence of damage to the container, rocket or missile.
- c. Perform operational checkout as prescribed for missile or rocket and record pertinent data.

6.2.1.2 Loading and Unloading

Determine the ease of removing and replacing the missile or rocket in the container as follows:

- a. Open the container and unload the missile or rocket body using prescribed procedures outlined in training literature. Observe all operations carefully and analyze the procedures used from a viewpoint of efficiency, ease and safety.
- b. Load the rocket or missile body slowly and deliberately back into the container and perform the same observation and analysis of the prescribed procedure.
- c. Repeat the unloading and loading procedure (timing and operations)

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at least five times and record the time for each complete loading and for each complete unloading operation and the following:

- 1) Any difficulties encountered
- 2) Any safety hazards
- 3) Observe comments regarding procedural improvements

6.2.1.3 Mobility and Sequential Troop Handling

a. Evaluate troop sequential handling of the missile/rocket loaded test item under simulated combat conditions by performing the following in order:

- 1) On-load the container onto a transporter.
- 2) Transport the container for a minimum of 5 miles over improved roads and 2 miles of cross country terrain to a tactical firing area.
- 3) Examine the container for and record any loss in pressure, when applicable.
- 4) Off-load the container.
- 5) Remove the missile or rocket body and perform an operational checkout.
- 6) Inspect the container and missile or rocket body for damage.
- 7) Load the missile or rocket into the container.
- 8) On-load the container onto the transporter.

b. Record the following:

- 1) Ease of loading and unloading the container on/off the transporter.
- 2) Difficulties encountered unloading and loading.
- 3) Safety hazards encountered.
- 4) Distance travelled over each type road sequence.
- 5) Time required to:
 - a) Off-load the container from the transporter and remove the missile or rocket.
 - b) Place the missile or rocket in the container and load the container on the transporter.

NOTE: 1. Troops used will be informed prior to starting the sequence that the operations shall be timed.
2. Missile or rocket checkout procedure time is evaluated with the weapon system and not as a part of container service test procedures.

c. Repeat the procedures of steps a and b a minimum of 5 times.

6.2.1.4 Adverse Conditions

a. Repeat the test procedures prescribed in paragraphs 6.2.1.2 and

6.2.1.3 under the following adverse conditions:

- 1) Blackout conditions.
- 2) Extremes of low temperature as occurs during the test period with test personnel wearing temperature zone winter clothing.
- 3) Inclement weather.

b. Record the following; as applicable;

- 1) Time required for each operation
- 2) Difficulties encountered due to:
 - a) Blackout conditions
 - b) Winter clothing
 - c) Precipitation

6.2.2. Pressure Test

Subject the test item with missile/rocket inclosed to the following pressurization test procedures:

- a. Pressurize the loaded container at the specified psig and leave it pressurized a minimum of 15 hours.
- b. Observe the indicated pressure at hourly intervals and record container pressure.

6.2.3 Rain Test

- a. Subject the empty container to a thorough wetting over the entire surface area from a suitable fresh water hose.
- b. Open the container, inspect the interior and record any evidence of moisture or leakage.
- c. If container is not pressurized check and record evidence of desiccant absorption.
- d. Photograph evidence of moisture or leakage as appropriate.

6.2.4 Field Storage

Determine the suitability of the test item for use in field storage by performing the following:

- a. At the beginning of the tests place a container, complete with missile/rocket in field storage for at least 90 days. During the storage period inspect the container for loss of pressurization and any evidence of deterioration.
- b. At the end of the storage period remove the missile/rocket and inspect for damage or deterioration due to storage.
- c. Perform operational checkout of missile/rocket.
- d. Record details of any deterioration and pertinent checkout data and photograph as appropriate.

6.2.5 Transportability

Determine the transportability of the test item, complete with missile or rocket section, by performing the following:

6.2.5.1 Surface Transportability

a. Subject the test item and missile/rocket section to the applicable sections of MTP 10-3-503.

b. At the completion of the various transportability tests of step a perform the following:

- 1) Examine the container and missile or rocket body and record damages as incurred, if any.
- 2) Perform an operational checkout of the rocket or missile and record pertinent data.

6.2.5.2 Air Transportability, Internal

a. Subject the test item and missile/rocket section to the applicable sections of MTP 7-3-515.

b. At the completion of the various transportability tests of step a perform the post-test procedures of paragraph 6.2.5.1.b.

6.2.5.3 Air Transportability, External

a. Subject the test item and missile/rocket section to the applicable sections of MTP 7-3-516.

b. At the completion of the various transportability tests of step a perform the post-test procedures of paragraph 6.2.5.1.b.

6.2.6 Human Factors Engineering

Throughout all tests observe and evaluate the human factors related to the test item as described in applicable sections of MTP 5-3-507 with particular emphasis on the following:

a. Design features that may have adverse effects upon the man-equipment relationship.

b. Potential error producing areas that may significantly effect speed or efficiency.

6.2.7 Maintenance

a. Evaluate the maintenance aspects of the test item as described in the applicable sections of MTP 10-3-504 and by performing all scheduled and unscheduled organizational maintenance services.

b. Record any difficulties encountered.

6.2.8 Safety Hazards

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a. Throughout all testing have test personnel observe for and record actual or potential safety hazards as described in applicable sections of MTP 5-3-510.

b. Confirm the safety characteristics of the test item and verify its compliance with requirements.

6.3 TEST DATA

6.3.1 Preparation for Test

6.3.1.1 Arrival Inventory

Record any missing tools and ancillary equipment.

6.3.1.2 Preoperational Inspection and Service

Record the following:

- a. Data collected as described in applicable sections of MTP 5-3-500.
- b. Difficulties encountered in performing preoperational service and maintenance.
- c. Adequacy of tools supplied.
- d. Tools required, but not furnished.
- e. Material workmanship defects.
- f. Damage incurred during shipment.

6.3.1.3 Physical Characteristics

a. Record the following container dimensions in feet and inches; as applicable:

- 1) Length
- 2) Width
- 3) Height
- 4) Circumference
- 5) Diameter
- 6) Other

b. Retail all photographs.

6.3.1.4 Personnel

Record the data collected as described in the applicable sections of MTP 10-3-501, and the following:

- a. Adequacy of supplied training literature
- b. For test personnel:
 - 1) Rank
 - 2) MOS
 - 3) Experience in MOS

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4) Training time in MOS

6.3.2 Test Conduct

6.3.2.1 Functional Performance

6.3.2.1.1 Rough Handling -

Record the following:

- a. For the tip test - the resistance of the container to tipping
- b. For the drag test:
 - 1) Any evidence of damage to container, rocket or missile
 - 2) Pertinent operational checkout data

6.3.2.1.2 Loading and Unloading -

Record the following:

- a. Time required for each loading operation
- b. Time required for each unloading operation
- c. Difficulties encountered
- d. Any safety hazards
- e. Observer comments regarding procedural improvements.

6.3.2.1.3 Transport and Sequential Troop Handling

Record the following:

- a. Time, in minutes for each of the following:
 - 1) Off-load the container from the transporter
 - 2) Unload the missile or rocket from the container
 - 3) Load the missile or rocket in the container
 - 4) Load the container on the transporter
- b. Details of any difficulties encountered
- c. Loss of container pressure
- d. Missile/rocket operability checkout data
- e. Damage incurred by container or rocket/missile
- f. Distance travelled in miles over:
 - 1) Improved roads
 - 2) Cross-country terrain

6.3.2.1.4 Adverse Conditions -

Record the following for each adverse condition:

- a. Adverse condition (blackout, cold, precipitation)

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- b. Load and unload data collected as described in paragraph 6.2.1.2
- c. Transportability data collected as described in paragraph 6.2.1.3
- d. Difficulties encountered due to, as applicable:

- 1) Blackout conditions
- 2) Winter clothing
- 3) Precipitation

6.3.2.2 Pressure Test

Record the following for each pressure reading:

- a. Elapsed time from start of test (1 hour, 5 hours, etc)
- b. Container pressure in psig

6.3.2.3 Rain Test

- a. Record the following as applicable:

- 1) Any evidence of moisture or leakage
- 2) Any evidence of desiccant absorption

- b. Retain photographs

6.3.2.4 Field Storage

Record the following:

- a. Length of field storage period.
- b. Summary of ambient (weather) storage conditions.
- c. Details of any pressurization losses.
- d. Evidence of deterioration to container and or missile/rocket due to storage conditions.
- e. Pertinent missile/rocket checkout data.

6.3.2.5 Transportability

Record the following:

- a. Surface transportability data collected as described in the applicable sections of MTP 10-3-503.
- b. Internal air transportability data collected as described in the applicable sections of MTP 7-3-515.
- c. External air transportability data collected as described in the applicable sections of MTP 7-3-516.
- d. For each transportability test performed:

- 1) Test performed
- 2) Damage to:

- a) Container

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b) Missile or rocket

3) Pertinent missile or rocket checkout data

6.3.2.6 Human Factors Engineering

Record the following:

- a. Data collected as described in applicable sections of MTP 5-3-507.
- b. Design features adversely affecting man-equipment relationship.
- c. Potential error producing situations that may significantly effect speed or efficiency.

6.3.2.7 Maintenance

Record the following:

- a. Data collected as described in the applicable sections of MTP 10-3-504.
- b. Difficulties encountered.

6.3.2.8 Safety Hazards

Record the following:

- a. Data collected as described in applicable section of MTP 5-3-510
- b. Observer comments regarding safety hazards
- c. Data collected relative to safety confirmation

6.4 DATA REDUCTION AND PRESENTATION

a. Chart or graph times recorded for:

- 1) Loading and unloading container
- 2) Onloading and offloading container

b. Chart or compare times for daylight, blackout, winter clothing, and precipitation operations.

c. Summarize results of:

- 1) Drag test
- 2) Tilt test
- 3) Rain test
- 4) Road test
- 5) Pressure test

d. Summarize any maintenance problems.

e. Summarize the effect of transport on the test item.

f. Summarize any recommendations for redesign due to human factors engineering.

g. Summarize any safety hazards and make a presentation relating

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to safety confirmation in accordance with USATECOM Reg. 385-6.

h. Summarize any degradation results due to field storage.

i. Summarize training literature deficiencies and recommendations
for improvement.

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